UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME   : MECHANICAL ACTUATING SYSTEMS

COURSE CODE   : DAE 19003

PROGRAMME   : 3 DAL

EXAMINATION DATE : DECEMBER 2013/ JANUARY 2014

DURATION   : 2 ½ HOURS

INSTRUCTION   : (A)   ANSWER **ALL** QUESTIONS FROM PART A.
                   (B)   ANSWER **THREE (3)** QUESTIONS ONLY FROM PART B.

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

PART A

Q1 (a) Belts are the cheapest utility for power transmission. Discuss the pros and cons of drive belt functionalities.

(10 marks)

(b) List common motion permitted by bearing. From the list, give examples of each motion.

(6 marks)

(c) One step of motor selection procedure is to calculate the load torque, moment of inertia and speed. Show how to calculate load torque for belt conveyor application.

(9 marks)

PART B

Q2 (a) Describe Engineering Drawing.

(6 marks)

(b) There are some common features in Technical Drawing. Differentiates features listed below;

(i) Geometry
(ii) Dimensions
(iii) Finish

(5 marks)

(c) List four (4) types of actuator.

(2 marks)

(d) Actuators are typically discussed in terms of mechanical implementation. How would you describe actuator in human body activities?

(2 marks)

(e) Screw and automotive break are examples of actuators applications. Classify them according to specific actuator types and explain their characteristics.

(10 marks)

Q3   (a)   From the **Figure Q3(a)(i)** and **Figure Q3(a)(ii)**, identify the mobility (m), number of joint (n), and number of DOF of kinematics pairs (j) according to simplified version of the *Kutzbach-Gruebler's* equations.

(5 marks)

(b)   Interpret the Grashof's Law about the pinned linkage of a planar 4-bar linkage.

(6 marks)

(c)   The 4-bar linkage is an adapted mechanical linkage used on bicycles. With a normal full-suspension bike the back wheel moves in a very tight arc shape. This means that more power is lost when going uphill. What would happen if we fitted a bike with a 4-bar linkage?

(2 marks)

(d)   From the **Figure Q3(d)**, name parts which labeled by A, B, C and D.

(2 marks)

(e)   Show a displacement diagram for cam that relates angular position, to the radial displacement experience at that position.

(10 marks)

Q4   (a)   Define a gear and explain how it can be considered as a simple machine.

(8 marks)

(b)   Illustrate all types of gears listed below;

    (i)   Rack and pinion
    (ii)   Helical
    (iii)   Spur
    (iv)   Worm

(10 marks)

(c)   Spur gears with a module, $m = 4$ mm transmit motion between two shafts with center distance, $C = 136$ mm. For the given transmission ratio, 3:1. Choose appropriate equation and find the number of teeth for each gear.

(7 marks)

Q5   (a)   From the **Figure 5(a)**, classify them according to class of lever. Explain your answer.

(6 marks)

        (b)   Distinguish the advantages between belt drive and chain drive.

(10 marks)

        (c)   Define the meaning of the following;

            (i)   Belt friction
            (ii)   Belt wear
            (iii)   Belt tension

(9 marks)

Q6   (a)   List three (3) types of bearing that you know. For each type of bearing explain the important features based on the following characteristics;

            (i)   Stiffness
            (ii)   Speed
            (iii)   Life

(12 marks)

        (b)   Friction is force between two surfaces rubbing together. Although there are good and bad thing about friction, but it some kind of "evil" in bearing. We cannot avoid it but we need to reduce it. So, why we need to reduce friction in bearing?

(5 marks)

        (c)   Show the procedure of motor selection using a flow chart.

(8 marks)

-END OF QUESTION-

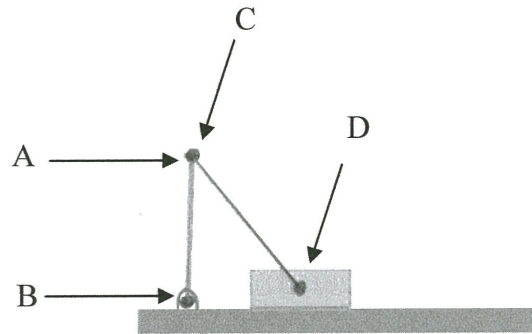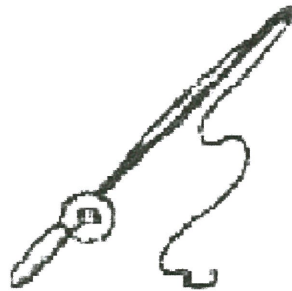| FINAL EXAMINATION			
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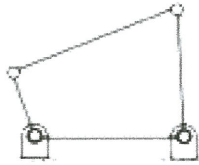
FIGURE Q3(a)(i)   **FIGURE Q3(a)(ii)**

FIGURE Q3(d)

FIGURE Q5(a)